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**A SYSTEM AND METHOD OF APPLYING ADAPTIVE CONTROL
TO THE CONTROL OF PARTICLE ACCELERATORS
WITH VARYING DYNAMICS BEHAVIORAL CHARACTERISTICS
USING A NONLINEAR MODEL PREDICTIVE CONTROL TECHNOLOGY**

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ABSTRACT OF THE DISCLOSURE

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The present invention provides a method for controlling nonlinear control problems within particle accelerators. This method involves first utilizing software tools to identify variable inputs and controlled variables associated with the particle accelerator, wherein at least one variable input parameter is a controlled variable. This software tool is further operable to determine relationships between the variable inputs and controlled variables. A control system that provides variable inputs to and acts on controller outputs from the software tools tunes one or more manipulated variables to achieve a desired controlled variable, which in the case of a particle accelerator may be realized as a more efficient collision.

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